United Nations ESCAP/CICTSTI/2018/7

Economic and Social Council

Distr.: General
20 June 2018

Original: English

Economic and Social Commission for Asia and th[illegible]ific
Committee on Information and Communications Techn[illegible]
Science, Technology and Innovation

Second session
Bangkok, 29–31 August 2018
Item 4 (b) of the provisional agenda*
Policy issues for science, technology and innovation: leveraging technology and trade for economic development

Leveraging technology and trade for economic development

Note by the secretariat

Summary

Technological progress and trade are inextricably linked. Global trade has accelerated the spread of innovation and technology, and technological advances – particularly in the areas of information and communication, transport, and electronic commerce and payment – have spurred international trade.

Technology continues to reshape international trade today, affecting not only what goods and services are traded but also the way in which they are traded. Electronic commerce and paperless trade are just two examples of how technology is changing the way in which trade has traditionally been conducted.

Trade, technology and industrial policies all affect the development of particular sectors and industries, and therefore directly or indirectly influence technological learning and progress. Historically, these policies have helped a few countries in the region to catch up. While policies today still play an important role in economic development and technological upgrading, certain measures that affect trade by protecting domestic markets or promoting exports are prohibited or restricted under multilateral trade agreements.

The Committee on Information and Communications Technology, Science, Technology and Innovation is invited to reflect on the opportunities and challenges related to the leveraging of technology and trade for economic development by sharing experiences and lessons learned in these areas. Furthermore, the Committee is invited to identify policy priorities and focus areas for regional cooperation to guide the work of the secretariat.

* ESCAP/CICTSTI/2018/L.1.

Please recycle

I. Introduction

1. Technology is a key factor that drives productivity growth and global market competition and defines global value chains. Technological innovation spawns new businesses and shapes the nature of international competition and international trade.

2. For many developing countries, such technological dynamism brings both opportunities and challenges. The Internet and smartphones have enabled the dissemination of information at an unprecedented scale and pace. Today, it is possible for firms and entrepreneurs to discover news or information about the most advanced technologies directly online. New ways of doing business, such as electronic commerce, enable individuals and small and medium-sized enterprises to participate more easily in international trade.

3. On the other hand, technology gaps between countries that are leading in the region and those that are lagging behind still exist or have been widening, making it difficult for some countries to climb up the global value chains, diversify exports and catch up with developed countries.

4. Policy intervention is critical in stimulating economic growth and technological progress for the countries in the region. The examples of a few Asia-Pacific countries having successfully caught up over the past several decades – the so-called East Asian miracle[1] – show that policy intervention can effectively gear economic development.

5. The environment for policymaking, however, is different from several decades ago. For example, free trade agreements impose restrictions on implementing certain types of policy measures. Any industrial and technology policy today needs to be compatible with trade rules. Furthermore, while the rapid development of digital and frontier technologies provides new business opportunities, many countries may find it difficult to keep the same pace in making and adapting laws and regulations to address the issues related to these technologies.

6. This document contains a review of the interplay and dynamism between trade and technology. Production technologies largely define what countries can produce and export. This process is dynamic because technological learning and upgrading take place in all countries, thus reshaping production and international trade. In this document, the emphasis is on issues on policies related to industry, trade, and science, technology and innovation in enhancing technological upgrading and innovation.

II. Production technology dictates what a country can produce and export

A. Production technology largely decides the structure of trade and global value chains

7. What a country produces or can produce is often defined by its endowment of physical and human capital, labour and natural resources, along with the overall quality of its institutions. For instance, mango grows in South-East Asian countries, where the soil and tropical climate are favourable for its

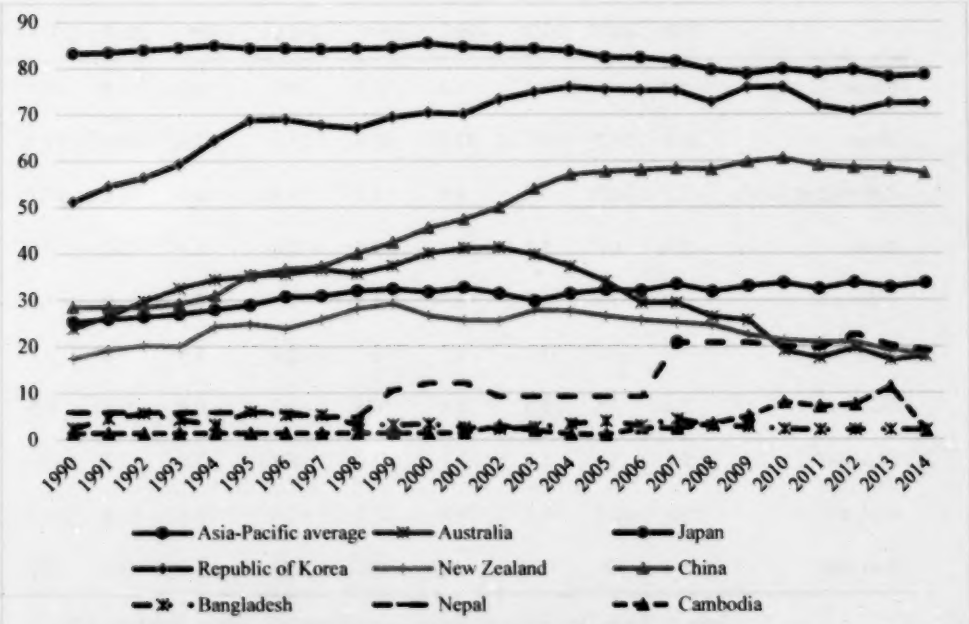
[1] World Bank, *The East Asian Miracle: Economic Growth and Public Policy – Main Report* (Oxford University Press, New York, 1993).

growth or a small island country may find it easier to develop tourism over heavy industry.

8. When products such as textiles and clothing are produced by many countries, cross-country differences in technology often explain the international pattern of specialization and trade because technology can play a vital role in the quality and costs of the final products. Technology gaps can also influence the type of goods exported. More advanced countries typically produce and export more technologically sophisticated goods. Technological upgrading takes place in every country worldwide at different speeds.

9. The evolution of exports in Asia-Pacific countries provides evidence for the above observations. Figure I shows that between 1990 and 2014, medium-high- and high-technology manufactured exports from Asia-Pacific countries on average increased from 24 to 34 per cent. During the same period, medium-high- and high-technology manufactured exports from Japan accounted for approximately 80 per cent of the country's total manufactured exports, while their share increased from 51 to 72 per cent in the Republic of Korea and from 28 to 57 per cent in China.

Figure I
Share of medium-high- and high-technology manufactured exports in total manufactured exports, Asia-Pacific countries, 1990–2014
(Percentage)



Source: Calculations by the Economic and Social Commission for Asia and the Pacific (ESCAP) based on United Nations Industrial Development Organization (UNIDO), "Medium and high-tech exports (% manufactured exports)", Competitive Industrial Performance database. Available at https://data.worldbank.org/indicator/TX.MNF.TECH.ZS.UN (accessed 20 June 2018).

Note: UNIDO uses a taxonomy of industry groups by technological intensity: (a) medium-high and high technology; (b) medium technology; and (c) low technology. For more information, see http://stat.unido.org/content/focus/classification-of-manufacturing-sectors-by-technological-intensity-%2528isic-revision-4%2529;jsessionid=F033873E486B87E001C2B35638A0793D.

10. Figure I also shows that in the three least developed countries from the region – Bangladesh, Cambodia and Nepal – the rate of medium-high- and high-technology manufactured exports is generally low. However, in Nepal, the share has substantially improved over time, having increased from 6 to 19 per cent between 1990 and 2014.[2] Interestingly, in two advanced economies in the region – Australia and New Zealand – there is a generally low rate of medium-high- and high-technology manufactured exports. This can be explained by natural endowment: the main exported goods from Australia and New Zealand are minerals and agricultural products respectively, which both belong to low-technology sectors.

11. The development of the manufacturing industry in China has had a substantial impact on the trade structure. As shown in table 1, in 1996, China, the Republic of Korea and Thailand exported the greatest percentage of low-technology products in the region, while Japan exported 30 per cent of high-technology products. By 2014, China exported the greatest percentage of high-technology products in the region, with a market share of 43.7 per cent.

Table 1
Share in Asia's manufactured goods exports against Asia's total manufactured exports
(Percentage)

	High technology			*Medium-high technology*			*Medium-low technology*			*Low technology*		
	1996	*2000*	*2014*	*1996*	*2000*	*2014*	*1996*	*2000*	*2014*	*1996*	*2000*	*2014*
China	5.9	9.4	43.7	6.3	10.1	36.5	10.8	14.9	34.6	21.2	26.3	55.4
Japan	30.0	25.5	7.7	52.8	49.8	23.6	27.6	24.7	11.1	5.4	5.1	2.0
Republic of Korea	7.3	10.7	9.4	9.9	9.7	14.4	15.4	16.2	15.1	7.6	6.7	2.4
India	0.4	0.3	1.7	1.1	1.2	3.6	1.9	2.5	9.6	6.0	6.7	9.4
Indonesia	0.9	1.4	0.5	0.9	1.4	1.7	2.6	3.0	1.8	6.1	5.9	5.2
Malaysia	9.4	9.7	4.7	2.2	2.1	2.4	3.5	3.6	4.2	4.5	3.4	3.2
Philippines	2.6	4.5	1.6	0.4	0.6	0.7	0.8	0.8	0.5	1.7	1.5	0.9
Thailand	3.8	3.6	2.7	2.1	3.0	5.2	2.5	3.2	3.6	6.5	5.5	4.3
Rest of Asia	39.8	35.0	28.0	24.3	22.2	11.8	35.1	31.1	19.5	41.0	39.1	17.1
Asia total	100	100	100	100	100	100	100	100	100	100	100	100

Source: Asian Development Bank, *Asian Economic Integration Report 2015: How Can Special Economic Zones Catalyze Economic Development?* (Manila, 2015).

12. While the share of high-technology export goods is an important indicator of a country's technology capacity, there are two important points to note. First, global value chains mean a country may actually assemble a high-technology product and work on low-technology activities with low value

[2] This may be explained by the fact that Nepal began implementing a structural adjustment programme in the mid-1980s with the support of the International Monetary Fund and the World Bank. For further details, see Prakash Kumar Shrestha, "Structural changes and economic growth in Nepal", 19 October 2010.

added. In this case, the country may not really own the high technology, although the final export product is counted in the high-technology exports of a country, which adds little value to total exports. Second, a low-technology product does not necessarily mean a low level of innovation. For example, technology fusion[3] – the combination of already existing technologies or engineering and science disciplines into new hybrids that are greater than the sum of their parts – can lead to innovation.[4]

13. In the future, new advanced technologies such as artificial intelligence and robotics may further reshape international trade patterns. It is possible that the flow of foreign direct investment may be reduced if foreign companies build factories in their home countries. Similarly, reshoring may occur, whereby foreign companies move their operations from developing countries back to their home countries. Evidence in this respect is scarce, probably because many new frontier technologies are still at the nascent stage of development and have yet to achieve widespread application. Nevertheless, it is important to monitor developments in this respect.

B. Trade can stimulate the diffusion of production technology

14. The international competition brought about by trade can have either positive or negative impacts on technology development. Trade can exert a market-pull effect on technology and innovation. In order to compete in the international market, producers have to be competitive in at least one area, such as low costs or high quality of products. A potential solution is through technological upgrading. Often, this means that producers need to be innovative or able to adopt appropriate technology. On the other hand, when an economy is open to trade, foreign products may crowd local producers out of the market. In some cases, import products may have a hugely adverse impact on local industry such as manufacturing or infant industries. The resulting deindustrialization may limit the opportunities of countries to understand and develop technologies.

15. Global value chains can contribute to technology diffusion. The local firms that participate in global value chains may directly receive the technologies. Furthermore, participating in global value chains can generate spillovers for other firms: there is always some leakage of technology or people, and some of the benefits are also felt by other firms. Such spillovers resulting from technology diffusion in the context of global value chains may happen backwards or forwards. Backward spillovers occur if there is a significant technology upgrading effect for suppliers when one of their clients receives foreign investment: the recipient firm's demand pattern changes, perhaps focusing more on the high-standard merchandise required by its foreign partner, and so the supplier needs to upgrade production to meet that demand.

16. For some specific technologies, a country may have a choice as to whether to develop its own or rely upon foreign technologies. Developing a technology – whether globally new or relatively new to a particular country – can be costly, time-consuming and risky. Hence, it may be more efficient for developing countries to acquire available foreign technologies, especially if the

[3] An example in mechatronics is Fanuc, a spin-off of Fujitsu that combined electronic and mechanical technologies to make computer controls for machine tools and industrial robots and become one of the most profitable companies in Japan. See Fumio Kodama, "Technology fusion and the new R&D", *Harvard Business Review*, July–August 1992.

[4] Lewis M. Branscomb, "Does America need a technology policy?", *Harvard Business Review*, March–April 1992.

technologies are easy to diffuse and adopt. In this way, a technologically underdeveloped country could catch up rapidly by absorbing the most advanced technologies.

17. On the other hand, there are several issues associated with reliance on foreign technologies. First, some foreign technologies are simply not for sale, especially if a technology is decisive for the core competitiveness of a company or a country. Second, in some cases, to maintain their competitiveness, multinational corporations may actually provide developing countries with the old generation of technologies. Third, in the case of technology import, the local firms may not be provided with full information about the technologies, therefore making any further innovation or adjustment difficult.

18. For a country or firm, reliance on foreign technology without its own innovation means being a follower of technology, and leapfrogging is prevented. Depending on the national strategy, if a country or firm aims to lead technology internationally, indigenous innovation – based on its own research and development capacity – is essential.

III. Technology underpins the evolution of international trade

A. Transport, information, communication and new technologies stimulate international trade

19. Historically, the development of transport and information and communications technology (ICT) has shaped trade. Today, over 80 per cent of global trade by volume and more than 70 per cent of its value is carried on board ships and handled by seaports worldwide.[5] In this sense, the importance of maritime transport for trade and development cannot be overemphasized.

20. Communication technologies such as the telephone and telegraph made it faster to negotiate and conclude trade deals than using the traditional postal service. Since the 1970s, electronic data interchange has been introduced to facilitate business communication, using electronic means instead of paper.

21. Technology continues to shape trade procedures and state-of-the-art technologies are being adopted. For instance, in the Republic of Korea, the customs service has recently started a pilot project on blockchains for import procedures.[6]

22. Digital technologies are rapidly changing what is tradable. Data are to this century what oil was to the last: a driver of growth and change. Flows of data have created new infrastructure, new businesses, new monopolies, new politics and – crucially – new economics.[7]

23. Information technology is being used to enhance tourism services such as travel bookings, planning of itineraries, marketing of destinations and information-sharing. With the rapid development of the Internet, smartphones, and fourth- and fifth-generation wireless systems, more media products, such as films, videos, music and audio recordings, radio broadcasts and video games, are becoming tradable. For example, the streaming company Netflix is

[5] *Review of Maritime Transport 2017* (United Nations publication, Sales No. E.17.II.D.10).

[6] Samburaj Das, "Korea Customs Service to pilot blockchain-based import customs platform", CCN, 6 June 2018.

[7] The Economist, "Data is giving rise to a new economy", 6 May 2017.

reported to be one of the most valuable media companies in the world, with a market value of $152.6 billion on 24 May 2018, and the company revealed that its current membership level was 125 million subscribers at the end of first quarter of 2018.[8]

B. Paperless trade and electronic commerce

24. Among numerous technologies that facilitate the conduct of international trade, as discussed above, paperless trade facilitation and electronic commerce are specifically reviewed here given their relevance to the countries in the region.

1. Paperless trade facilitation

25. Paperless trade generally comprises the implementation of innovative and technology-driven measures aimed at enabling trade using electronic rather than paper-based data and documentation. Customs automation systems and national single windows are widely cited examples of paperless trade. A survey conducted by the secretariat on trade facilitation and paperless trade, covering 44 countries in Asia and the Pacific, shows that electronic/automated customs systems are available in most of the countries surveyed (41 of 44) and have been fully implemented in more than half.[9] Challenges remain for implementing electronic single-window systems, which have been implemented fully, partially or on a pilot basis in 23 countries, or more than 50 per cent of all the Asia-Pacific countries surveyed.

26. Cross-border paperless trade refers to trade in goods, including their import, export and transit and related services, that takes place on the basis of electronic communications, including the exchange of trade-related data and documents in electronic form. The survey results show that there has been limited electronic exchange of trade-related data among countries, and often on a pilot basis only.

27. Achieving cross-border paperless trade across the region is expected to be a long and difficult process, which cannot be achieved without close collaboration between countries. To enhance cross-border paperless trade, on 19 May 2016, the Commission, at its seventy-second session, adopted the Framework Agreement on Facilitation of Cross-border Paperless Trade in Asia and the Pacific. Subsequently, five countries in the region – Armenia, Bangladesh, Cambodia, China and the Islamic Republic of Iran – signed the Framework Agreement in 2017, while Azerbaijan acceded to it in March 2018. The secretariat estimated that full implementation of the Framework Agreement would achieve estimated cuts in regional trade costs of 25 per cent on average. Furthermore, estimates show that potential annual export gains associated with moving from manual paper-based trade to paperless trade are estimated to be $257 billion in the region.[10]

---

[8] Tae Kim, "Netflix briefly tops Disney as the biggest pure media company in the world by market value", CNBC, 24 May 2018.

[9] The survey was led by the secretariat, with the participation of all the regional commissions and other partners. For detailed information, see https://unnext.unescap.org/content/un-global-survey-trade-facilitation-and-paperless-trade-implementation-2017.

[10] *Digital Trade Facilitation in Asia and the Pacific* (United Nations Publication, Sales No. E.18.II.F.10).

2. Electronic commerce

28. E-commerce refers to the sale and purchase of goods and services through electronic networks and the Internet. There are four main types of e-commerce: business-to-business, business-to-consumer, consumer-to-consumer and, to a lesser extent, business-to-Government.[11]

29. Available data show the importance of e-commerce for international trade. The United Nations Conference on Trade and Development (UNCTAD) estimates that the value of global e-commerce was $25 trillion in 2015, compared with $16.1 trillion in 2013. The United States of America is by far the largest market for e-commerce, with combined sales equalling more than $7 trillion in 2015, while China has the largest business-to-consumer market in the world. In China, e-commerce accounted for 18 per cent of its gross domestic product.[12]

30. E-commerce can promote inclusive development. Compared with traditional trade, e-commerce helps local businesses – especially micro- and small enterprises – individual persons, women entrepreneurs and farmers to reach a broader domestic or international market. E-commerce, in particular cross-border e-commerce, may also bring competition to local markets. A recent study points out that retail in general and e-commerce in particular are thin-margin businesses.[13] Adaptation to e-commerce is not automatic, however, and traditional bricks-and-mortar retailers may struggle to cope with the fierce competition that it brings.

31. Cross-border e-commerce brings new challenges to border agencies such as customs in many countries. The functions of border agencies have traditionally been designed to handle bulky cargo. E-commerce means the cargo arrives in a large number of small parcels: in practice, it is almost impossible to physically check every parcel, meaning that some illegal goods may be shipped to a country in disguise.[14] Second, the small parcels may involve questions with regard to tax. In many countries, the *de minimis* rule means that cargo can be exempted from tax if its value is under a threshold requirement. In theory, traders can exploit this rule by shipping multiple parcels instead of a single one to avoid tax. For instance, purchases from foreign e-commerce vendors outside of Thailand are subject to 7 per cent value added tax only if the value exceeds 1,500 baht, but some online operators exploit the loophole by breaking up invoices into amounts below the threshold to skirt the levy.[15]

---

[11] *Asia-Pacific Trade and Investment Report 2016: Recent Trends and Developments* (United Nations publication, Sales No. E.16.II.F.23).

[12] UNCTAD, "Ministers to discuss opportunities and challenges of e-commerce with Jack Ma, eBay, Jumia, Huawei, Etsy, PayPal, Vodafone and more", 21 April 2017.

[13] Sunil Gupta and Tanya Bijlani, "E-commerce in Asia: challenges and opportunities", *Asia Business Insights* (2012).

[14] Michael Morantz, "The dark side of the digital economy: bad things come in small packages", OECD Insights, 18 May 2018.

[15] Bangkok Post, "E-business tax primed for scrutiny", 7 March 2018.

IV. Formulating effective and coherent policies on trade, industry and technology

A. Overview of policies

1. Trade policies

32. Trade policy measures affect imports and exports of goods, and come in the form of changed tariff rates or other duties, quantitative restrictions including bans, customs procedures, taxes and a whole array of other, non-tariff, measures. Their prominent feature is the ability to discriminate between different markets, products and services.

33. Historically, countries in the region have adopted different trade policies, which fostered the development of particular sectors and the relevant technologies in those sectors. As shown in table 2, these policies have evolved over the past several decades, starting with import substitution, which has evolved into export orientation. Export orientation normally begins with assembly or original equipment manufacturing as well as light industries, and over time the value added of exports increases. Often, export-oriented policies ran parallel to import-substitution policies, as protection was removed only gradually.

Table 2
Shifting of trade and industrial policies in selected economies in Asia

Indonesia	**1948–1966:** Economic nationalism; nationalization of Dutch enterprises	**1967–1973:** Some trade liberalization	**1974–1981:** Oil and commodity boom	**1986 onward:** Gradual trade liberalization and export promotion
Republic of Korea	**1961–1973:** Initial export take-off	**1973–1979:** Heavy and chemical industry drive: selective promotion	**1980–1990:** Gradual trade liberalization and move to less selectivity	**1990 onward:** Trade liberalization and high-technology exports
Malaysia	**1950–1970:** Natural-resource-based exports	**1971–1985:** Import substitution and export promotion through export processing zones	**1986 onward:** Gradual trade liberalization and export promotion	
Taiwan Province of China	**1953–1957:** Import substitution	**1958–1972:** Export promotion	**1973–1976:** Industrial consolidation	**1981 onward:** High-tech industrialization
Thailand	**1955–1970:** Natural-resource-based exports	**1971–1980:** Import substitution	**1980 onward:** Trade liberalization and export promotion	
Singapore	**1959–1964:** Labour-intensive import substitution	**1967–1973:** Labour-intensive export promotion	**1973–1984:** Upgrading export structure	**1985 onward:** Export promotion of high-tech and services
Japan	**1950–1958:** Import substitution	**1959 onward:** Export-oriented trade and foreign exchange	**1967 onward:** Liberalization	**Mid-1980s:** Deregulation

Philippines	**1950 onwards:** Import substitution	**1967–1973:** Continued import substitution	**1980s onward:** Liberalization (political stability)	**1990s onward:** Continued liberalization (strengthened political stability)
Hong Kong, China	**1950 onward:** Export orientation (laissez-faire, education, infrastructure and institutional support)	**1979 onward:** Improved institutional support for industry		**1990s onward:** Upgraded support for technology
China	**1965–1976:** Defence/industry (heavy industrialization)	**1977–1978:** Plant import	**1980s onward:** Coastline liberalization (light industries)	**1990s onward:** High-technology infrastructure

Source: Adapted from John Weiss, "Export growth and industrial policy: lessons from the East Asian Miracle experience", ADB Institute Discussion Paper, No. 26 (Tokyo, Asian Development Bank, 2005); and *Industrial policy and the WTO* (United Nations publication, Sales No. E.00.II.D.26).

34. The 1980s saw a gradual trade liberalization. As of June 2018, 262 preferential trade agreements that had at least one member from the Asia-Pacific region were in force, had been signed or were under negotiation.[16] Despite this, various forms of trade protectionism still exist today. Measures both to restrict and liberalize trade have been applied around the world, including by the countries in the region. For example, between October 2015 and May 2017, 256 trade-restrictive measures were introduced at the global level, 27 per cent of which by Asia-Pacific economies.[17]

2. Industrial policies

35. Industrial policy, in general, refers to any type of selective intervention that attempts to alter the structure of production towards sectors that are expected to offer better prospects for economic growth than would occur in the absence of such intervention, in the market equilibrium.[18] In a broad sense, industrial policies do not have to be written down or publicized. Whenever a Government consciously favours certain economic activities over others, it can be treated as the implementation of industrial policy.[19]

36. Several countries in the region have adopted industrial policies to achieve economic development. For instance, between the 1960s and 1980s, the Republic of Korea maintained an outward-oriented, bottom-up and integrated approach to industrial policy. The Government and chaebols[20]

[16] See www.unescap.org/content/aptiad.

[17] For further information, see *Asia-Pacific Trade and Investment Report 2017: Channelling Trade and Investment into Sustainable Development* (United Nations publication, Sales No. E.17.II.F.22).

[18] Howard Pack and Kamal Saggi, "Is there a case for industrial policy? A critical survey", *World Bank Research Observer*, vol. 21, No. 2 (September 2006).

[19] Dani Rodrik, "Industrial policy for the twenty-first century", paper prepared for UNIDO, Cambridge, Massachusetts, 2004.

[20] A chaebol is a family-run conglomerate in the Republic of Korea. Such groups have been at the heart of its rapid industrial development over many years and tower over almost every area of business. For further information, see http://lexicon.ft.com/Term?term=chaebol.

systematically studied what had to be done to fill the missing links in the domestic value chain and move up the quality ladder, through technology acquisition, human resources development and construction of optimal-scale plants aimed for the global market. As the capacity of the private sector increased and sector-targeting became a more difficult proposition, the Republic of Korea shifted to a more sector-neutral approach, which provided support for industry rationalization and research and development regardless of sector.[21]

37. Evolution of the industrial revolution can also be observed in China. The National Medium- and Long-term Programme for Science and Technology Development (2006–2020) identifies 402 core technologies, ranging from pharmaceuticals to integrated circuits, for prioritized development.[22] Today, arguably, the most important industrial policy in China is the Made in China 2025 plan, and the implementation of subsequent supportive policy measures, which are focused on indigenous innovation and upgrading of manufacturing capabilities.[23]

3. Science, technology and innovation policies

38. National science, technology and innovation policies serve several functions. First, they articulate the Government's vision regarding the contribution of science, technology and innovation to the country's social and economic development. Second, they set priorities for public investment in science, technology and innovation and identify the focus of government reforms. Third, the development of these strategies can engage stakeholders ranging from the research community, funding agencies, business and civil society to regional and local governments in policymaking and implementation. In some cases, national strategies outline the specific policy instruments to be used to meet a set of goals or objectives. In others, they serve as visionary guideposts for various stakeholders.[24]

39. In Thailand, the conceptual framework of the National Science, Technology and Innovation Policy and Plan 2012–2021 identifies challenging issues impacting the development of science, technology and innovation to better serve the needs of the economy and society of Thailand throughout the next decade.[25]

4. Policies today are often bound by international trade rules

40. Evidence shows that policies related to industry, trade and science, technology and innovation have been widely used in practice, not only by countries in the region, but also by traditionally advanced economies. For instance, a study shows that discrimination across sectors, against foreign commercial interests and between domestic firms have been important features of policy choice by large economies such as Brazil, China, the European Union, Japan, the Republic of Korea, the Russian Federation and the United

---

[21] Joseph E. Stiglitz, Justin Yifu Lin and Célestin Monga, "The rejuvenation of industrial policy", Policy Research Working Paper, No. 6628 (Washington, D.C., World Bank, 2013).

[22] Reggie Lai and Lingling Deng, "China's industrial policy and its implications for foreign manufacturers", American Chamber of Commerce in Shanghai, 9 November 2017.

[23] See http://english.gov.cn/2016special/madeinchina2025.

[24] Organization for Economic Cooperation and Development, "National strategies for STI", *OECD Science, Technology and Innovation Outlook 2016* (Paris, 2016).

[25] See www.sti.or.th/encontent.php?content_type=3.

States of America since the beginning of the global financial crisis in 2007, although resort to them by these countries differed.[26]

41. In an era of free trade, policy measures widely used three or four decades ago may not be valid according to international trade rules. Under the framework of free trade agreements (multilateral, regional and bilateral), some selective interventions that affect trade by protecting domestic markets or promoting exports are prohibited or restricted under multilateral trade agreements signed under the auspices of the World Trade Organization (WTO). Among them are restrictions on the use of export subsidies, prohibition of performance requirements such as domestic content requirements, and limits on the use of quantitative restrictions on imports. There are, however, (temporary) exceptions to the above rules, such as special and differential treatment, that allow developing countries to retain or use some policy instruments whose use would otherwise be forbidden or restricted.[27]

42. Of the 53 member States of the Economic and Social Commission for Asia and the Pacific (ESCAP), 40 are WTO members and five are in the process of accession to WTO, meaning that 85 per cent of ESCAP member States are or will be subject to WTO trade disciplines.[28]

43. Technology transfer and innovation are covered by several WTO agreements, such as those on subsidies, intellectual property, services and technical barriers to trade, as shown in table 3.

Table 3
Coverage of policies related to technology and innovation in the agreements of the World Trade Organization

Policy/measure	*Relevant WTO agreement*
Domestic support and incentives for research and development (for example, subsidies)	Agreement on Subsidies and Countervailing Measures Agreement on Agriculture
Protection and enforcement of intellectual property rights	Agreement on Trade-Related Aspects of Intellectual Property Rights
Commercialization of publicly funded research	Agreement on Trade-Related Aspects of Intellectual Property Rights
Transfer of technology and know-how	General Agreement on Trade in Services Agreement on Trade-Related Investment Measures Agreement on Trade-Related Aspects of Intellectual Property Rights

[26] Vinod K. Aggarwal and Simon J. Evenett, "Industrial policy choice during the crisis era", *Oxford Review of Economic Policy*, vol. 28, No. 2 (July 2012).

[27] *Economic Development in Africa Report 2014: Catalysing Investment for Transformative Growth in Africa.* (United Nations publication, Sales No. E.14.II.D.2).

[28] See www.unescap.org/sites/default/files/ESCAP%20members%20and%20associate%20members%20and%20status%20of%20their%20membership%20in%20WTO-1%20May%202017.pdf.

Policy/measure	*Relevant WTO agreement*
Government procurement	General Agreement on Tariffs and Trade
	Agreement on Trade-Related Investment Measures
	Agreement on Government Procurement
Technical standards	General Agreement on Tariffs and Trade
	Agreement on Technical Barriers to Trade
	Agreement on the Application of Sanitary and Phytosanitary Measures
Competition policy	Agreement on Trade-Related Aspects of Intellectual Property Rights
	Agreement on Trade-Related Investment Measures
Policy/regulatory frameworks and general infrastructure	Aid for Trade initiative

Source: John M. Curtis, *Trade and Innovation: Policy Options for a New Innovation Landscape* (Geneva, International Centre for Trade and Sustainable Development and World Economic Forum, 2016).

B. Policy priorities

44. Developing countries may have the most to gain from applying some level of industrial policy appropriate to their strategic development and science, technology and innovation policy aspirations. This is because development involves structural transformation and diversification processes which create rather than exploit existing comparative advantage.[29]

45. Countries in the region differ in terms of economic structure, national and financial resources and access to international market, among other differences. A one-size-fits-all development strategy is probably unrealistic. Notwithstanding the differences, the following recommendations may be regarded as common denominators.

1. Aligning all policies with national strategy

46. Despite the importance of policies related to industry, trade and science, technology and innovation, policymakers should never lose sight of the fact that these policies should be designed and implemented within a much broader framework of national strategy. Policy should be geared towards supporting the country in acquiring, absorbing and upgrading technologies, enhancing productivity and moving up the ladder of global value chains, rather than answering rent-seeking lobbies.

47. Historically, several countries in the region have successfully adopted policies to achieve technological upgrading and economic development. As shown in table 2, the industrial and trade policies adopted by 10 economies in the region between the 1950s and the 1990s were geared to support and spur technological learning and upgrading and support a national strategic plan of economic development. The export of primary products was vitally important for the economies in the table in the 1960s. Between the 1960s and the 1980s, exports of textiles, clothing and footwear from these economies were initially important and subsequently declined in relative terms. In the 1980s, several of these economies substantially increased their exports of more capital- and

[29] Rodrik, "Industrial policy".

technology-intensive goods, such as electrical machinery, chemicals and pharmaceuticals, and computer and communications equipment. Some of these goods embodied advanced, international best-practice technology. In the 1990s, several more countries moved to more technologically-intensive sectors, such as computers and communications equipment. These two categories accounted for 24 per cent of total non-oil exports in Malaysia and for 14 per cent in Thailand in 1994.[30]

48. Today, countries in the region continue to adopt policies to achieve a national strategy. In the Philippines, the Comprehensive National Industrial Strategy aims to link and integrate manufacturing, agriculture and services, address supply-chain gaps and deepen industry participation in global value chains. Strategic action includes, among others, innovation and research and development activities and green industries.[31]

49. One strategy is to develop more generic technologies which have the potential to bring benefits to multiple sectors. For instance, according to the Fifth Science and Technology Basic Plan of Japan, the Government will further promote the development of technology for the Internet of things, big data analytics, high-speed processing devices, artificial intelligence, networking, edge computing and cybersecurity, which are seen as the fundamental technologies necessary to build the service platform for a so-called super-smart society. The Government will also promote the development of such technologies as those related to robotics, sensors and human interface, which are seen as the fundamental technologies that are the country's strengths and which form the core of new value creation.[32]

50. Alternatively, the adoption of advanced technologies may start with a small group of firms, sectors or geographic areas, taking possible scalability and wide technology diffusion into consideration. This strategy may be particularly suitable for small economies with limited financial and human resources to adopt technologies for all sectors. Even for relatively large economies, this strategy enables the country to go through a process of learning and, probably, trial and error. An example in this respect is the strategy in Indonesia of using frontier technology for productivity enhancement, in five main sectors in particular: food and beverage, textiles and clothing, automotive, electronics and chemical.[33]

2. Enhancing institutional cooperation

51. Different policies are formulated by different ministries and departments. Trade policies are most likely formulated by the ministry in charge of trade and commerce, industrial policies by the ministry of industry and enterprise, and science, technology and innovation by the ministry of

---

[30] Weiss, "Export growth and industrial policy".

[31] For further information, see http://industry.gov.ph/comprehensive-national-industrial-strategy.

[32] See www.tillvaxtanalys.se/download/18.36a7c6515478fc61a479ce2/1463050071286/Japans%20fem%C3%A5rsplan.pdf.

[33] Bambang Brodjonegoro, Minister of National Development Planning and Head of the National Development Planning Agency of Indonesia, "Tapping technology advancement to achieving SDGs", presentation to the Commission at its seventy-fourth session, Bangkok, 16 May 2018. Available at www.unescap.org/commission/74/files/16may-am-Mr_Bambang_Brodjonegoro-ppt.pdf.

science and education. As such, policies covering technology and innovation may be fragmented.

52. To ensure that the policies are consistent and mutually strengthening, it is essential to establish a coordinating mechanism between policymakers and representatives of funding agencies, education and industry, in an effort to synchronize institutional action to better match the strategy related to science, technology and innovation and development. This institutional arrangement also requires awareness of trade policies and communication and capacity-building in relation to them. For instance, if the policies on science, technology and innovation are prepared by the ministry of science, its staff may not be aware of the trade rules on technology transfer. Support from the ministry in charge of trade and commerce is therefore essential.

53. Countries in the region have adopted different approaches in institutional cooperation. In Singapore, the innovation ecosystem comprises various ministries and research and development funding bodies and performers. At the top is the Research, Innovation and Enterprise Council, chaired by the Prime Minister, which oversees the long-term strategy to transform Singapore into a knowledge-based society, with strong capabilities in research and technology. The Council is supported by the National Research Foundation Board, which is responsible for the formulation of five-year plans and policies to grow the country's research capability, support economic growth and meet future national challenges.[34]

54. The Malaysian Industry-Government Group for High Technology was established on 22 February 1993 as the technology think tank under the purview of the Prime Minister's Department. It is governed by a board of directors and helmed through the joint chairmanship of a prominent private sector personality and the Science Advisor to the Prime Minister. The Group emphasizes market intelligence initiatives using foresight practices and methodology to identify technology and business opportunities. It is built on the strength of public-private partnership with members representing both local and international organizations.[35]

3. Paying equal attention to technology commercialization and research and development

55. Traditional thinking of innovation as a linear process from research and development, scientific breakthrough and intervention to commercialization of technologies explains why countries often support higher education and research and development. However, since the early 1980s, the theory of the national innovation system has increasingly gained recognition. It includes the argument that innovation often takes place in enterprises and firms; transformation from a breakthrough in a laboratory to commercial viability is rarely automatic, and innovation can also be unpredictable. Therefore, to effectively encourage innovation, a country should facilitate the development of a national environment that is conducive to innovation.[36]

56. While developing a national innovation system may be a long-term goal, policies can always be guided to support firms and enterprises to innovate. Figure II shows four groups of firms according to their awareness of and absorptive capacity for technology and their desire to innovate. At the

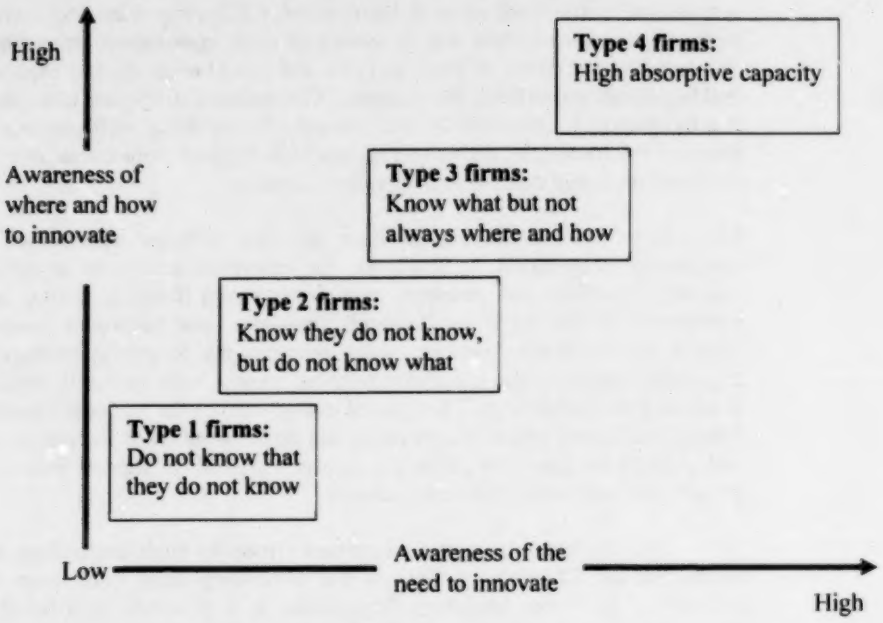
[34] See www.nrf.gov.sg/about-nrf/rie-ecosystem.

[35] For further information, see www.might.org.my/about-us.

[36] Chris Freeman, "The 'national system of innovation' in historical perspective", *Cambridge Journal of Economics*, vol. 19, No. 1 (February 1995).

lowest level are firms with no capacity for technological change and that do not feel any need for change.

Figure II
Classification of firms by their technological capability and motivation to change


High
Awareness of where and how to innovate
Type 4 firms: High absorptive capacity
Type 3 firms: Know what but not always where and how
Type 2 firms: Know they do not know, but do not know what
Type 1 firms: Do not know that they do not know
Low
Awareness of the need to innovate
High

Source: Based on World Bank, "Part A: firm-level innovation in the Korean economy", in *Korea: Technology, Skills and Internet Services in Korea –Moving Towards a Knowledge-based Economy* (Washington, D.C., 2003). Available at https://openknowledge.worldbank.org/bitstream/handle/10986/14615/multi0page.pdf?sequence=1.

Note: The study, published in 2003, focused on firms in the Republic of Korea. However, the discussion is still relevant to many firms in developing countries in the region.

57. Policies in this case should focus on moving firms up the ladder by addressing two dimensions, as shown in figure II. First, through policies, firms should be encouraged to improve their capacity to absorb technologies. In particular, policies related to trade and foreign direct investment may help firms gain access to foreign technology. Second, policies should be used to improve the internal motivation of firms to change. Through the policies, an environment needs to be created that is conducive to "healthy" market competition, so that firms and entrepreneurs will then choose to innovate and absorb appropriate technologies based on their reading of their markets.

58. In Singapore, innovation and enterprise, academic research and manpower are identified as three cross-cutting programmes to achieve its Research, Innovation and Enterprise 2020 Plan.[37] In Kazakhstan, innovation and technology have been fostered in the Technology Commercialization

[37] See www.nrf.gov.sg/rie2020.

Project, which is being implemented by the Ministry of Education and Science of Kazakhstan and assisted by the World Bank.[38]

4. Embracing digital trade and the information economy

59. As discussed in sections II and III, the rapid development of technology, especially ICT, has constantly changed the dynamism between technology and trade. Electronic commerce is an important example of such reliance on trade, transforming the way in which traditional trade is conducted and stimulating trade growth.

60. Domestic policies need to address the new business opportunities and potential challenges of electronic commerce and digital trade. On the one hand, policies must support micro- and small enterprises, individuals and rural smallholders in participating in electronic commerce so that they can access larger domestic and international markets, thereby promoting inclusive development. On the other hand, policies must also address the adverse effects. For example, the competition created by e-commerce may put substantial pressure on traditional bricks-and-mortar small-scale retailers and local suppliers (such as local producers and vendors), and in some cases may force them out of the market. Policies must be introduced to address the challenges of job losses due to the digital economy.

61. At the regional level, collaboration among countries provides another dimension of exploring the benefits of technology. For instance, the Framework Agreement on Facilitation of Cross-border Paperless Trade in Asia and the Pacific, as mentioned earlier, features modules on capacity-building and technical assistance, which enable all countries in the region, including the least developed countries, to benefit from cross-border paperless trade.

62. In a broader sense, the rapid development of ICT and penetration of the Internet mean that most, if not all, countries in the region are moving towards digital trade or an information economy, although the pace in this process differs. Among multidimensional issues to be addressed through policies, personal data protection has been one of the most important topics for discussion. The entry into application of the General Data Protection Regulation in May 2018, which constitutes a single set of data protection rules for all companies operating in the European Union, certainly has profound implications for policymaking in the region.[39]

5. Playing by the trade rules

63. Developing countries operate today in a global policy environment that is very different to that of two or three decades ago. In particular, there has been a tendency to limit national economic policies through multilateral, regional or bilateral agreements, imposing restrictions on the ability of developing countries to introduce certain types of policies related to industry, trade and science, technology and innovation. For instance, export subsidies may not be a valid policy measure under a free trade agreement.

64. Accordingly, whenever policies related to industry, trade and science, technology and innovation are developed and implemented, it is important to

[38] World Bank, "Technology commercialization for an innovative economy in Kazakhstan", 23 January 2014.

[39] For further information, see https://ec.europa.eu/commission/priorities/justice-and-fundamental-rights/data-protection/2018-reform-eu-data-protection-rules_en.

ensure that these policies are compatible with any trade agreements to which a country is party.

65. On the other hand, the least developed countries should explore the potential opportunities brought about by international trade agreements. For instance, article 66 (2) of the Agreement on Trade-related Aspects of Intellectual Property Rights states that developed country members should provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least-developed country members in order to enable them to create a sound and viable technological base.[40]

V. Conclusion

66. In 1955, Nobel laureate Arthur Lewis pointed out that no country had made economic progress without positive stimulus from intelligent Governments.[41] His statement has been echoed by the fact that over the past several decades, a number of countries in the region – such as China, Japan and the Republic of Korea – have successfully adopted policies related to industry, trade and science, technology and innovation in the process of catching up with other countries.

67. Today, Governments and policymakers still have an important role to play in the process of economic development. In an era of free trade and international competition, technological upgrading and innovation constitute an essential ladder for developing countries in the region to develop their economies and climb up the global value chains. Relying purely on the market will probably lock developing countries, especially the least developed countries, into their areas of comparative advantage, such as labour-intensive and low-technology industries, and exacerbate their marginalization in the international market.

68. A holistic policy approach needs to be adopted by the countries in the region to address the challenges of economic development and technological upgrading. Government policies should aim to create an enabling environment so that the market encourages innovation. This enabling environment should also facilitate collaboration between multiple stakeholders – such as universities, research institutions, firms and enterprises, international companies and multinational corporations – for the purposes of innovation.

69. Countries in the region need to be proactive in adopting new digital technologies such as big data and e-commerce. While debates on the pros and cons of these technologies will continue, in reality there is no turning back; these technologies continue to penetrate every country. Indeed, countries in the region should take advantage of the new opportunities for business and trade that are generated by these technologies. On the other hand, the diffusion of these technologies imposes new challenges on rules and regulations. Some emerging issues, such as personal data protection, are receiving profound attention internationally, especially in the light of the entry into application of the General Data Protection Regulation in May 2018. Countries in the region need to make or adjust policies to cope with the new challenges related to areas

[40] See *Legal Instruments Embodying the Results of the Uruguay Round of Multilateral Trade Negotiations, done at Marrakesh on 15 April 1994* (GATT secretariat publication, Sales No. GATT/1994–7).

[41] W. Arthur Lewis, *The Theory of Economic Growth* (London, Allen and Unwin, 1955).

such as cross-border data flow, intellectual property, privacy and cybersecurity.

VI. Issues for the consideration by the Committee

70. Innovation growth can be path-dependent, and solutions for enhancing innovation can vary from country to country. Nevertheless, as discussed in the present document, there are also common issues related to trade and technology in the region. Successful experiences and lessons learned in leveraging technology and trade for development should be shared among countries in the region. In this connection, the Committee on Information and Communications Technology, Science, Technology and Innovation may wish to debate the following questions, ideally by reflecting on the experiences of member States:

(a) What are the drivers of technological change and the catch-up process in developing countries?

(b) How can developing countries successfully build up their own modern industries through indigenous innovation and foreign technologies?

(c) How can developing countries take advantage of digital trade and the digital economy?

(d) What policy interventions in the areas of trade, industry and science, technology and innovation have proved effective in achieving their goals?

71. The Committee may wish to discuss other issues contained in the present document. Furthermore, the Committee may wish to provide guidance to the secretariat on research topics that it should undertake and on other types of support, such as technical assistance or capacity-building, that it should provide.

United Nations ESCAP/CICTSTI/2018/8

Economic and Social Council

Distr.: General
18 June 2018

Original: English

Economic and Social Commission for Asia and the Pacific
Committee on Information and Communications Technology, Science, Technology and Innovation

Second session
Bangkok, 29–31 August 2018
Item 4 (c) of the provisional agenda*
Policy issues for science, technology and innovation: regional mechanisms for technology transfer for sustainable development

Report of the Asian and Pacific Centre for Transfer of Technology on its activities during the period 2016–2018

Note by the secretariat

Summary

Since its inception in 1977 as a subsidiary body of the Economic and Social Commission for Asia and the Pacific, the Asian and Pacific Centre for Transfer of Technology has been supporting member countries in nurturing and strengthening national innovation systems and creating an enabling environment for the development and transfer of technology so that member countries can meet development challenges in today's globalized knowledge-based economy.

In recent years, a number of disruptive innovations have emerged with the use of digital information such as big data, the Internet of things, massive open online courses, 3D printing and digital automation. Such new technologies and related innovations have changed the landscape of different industries, making them more competitive and providing policymakers with the opportunity to apply such technologies for social purposes. The Centre is keen to develop new capacity-building activities in the area of new and emerging technologies to support member countries in their efforts to take full advantage of such innovations in order to achieve the Sustainable Development Goals.

The present document contains a review of regional mechanisms for the transfer of technology to promote sustainable development with reference to the activities conducted and the outcomes achieved by the Centre during the period 2016–2018. It also contains highlights of future areas of work for review and consideration by the Committee on Information and Communications Technology, Science, Technology and Innovation.

The Committee may wish to provide input and suggestions to support and strengthen the Centre's work for achieving the Sustainable Development Goals.

* ESCAP/CICTSTI/2018/L.1.

I. Introduction

A. Background and institutional linkages

1. At the first Asian Conference on Industrialization held in Manila in 1965, a series of recommendations was made for a regional mechanism to accelerate transfer of technology in the region. Subsequently, in accordance with resolutions 159 (XXXI) of 1975 and 164 (XXXII) of 1976 of the Economic and Social Commission for Asia and the Pacific (ESCAP), the Regional Centre for Technology Transfer was established in Bangalore, India, on 16 July 1977. The Government of India offered host facilities for the Centre. In 1985, in accordance with Commission resolution 243 (XLI), the Centre was renamed the Asian and Pacific Centre for Transfer of Technology. The Centre was relocated from Bangalore to New Delhi on 1 July 1993.

2. In the four decades of its operation, the Centre has assisted members and associate members of ESCAP in strengthening their capabilities to develop and manage national innovation systems; develop, transfer, adapt and apply technology; improve the terms of transfer of technology; and identify technologies relevant to the region and promote their development and transfer.

3. The Centre's programmes and activities contribute to subprogramme 2 (Trade and investment) of the Commission's strategic framework for the period 2016–2017 and subprogramme 2 (Trade, investment and innovation) of the strategic framework for the period 2018–2019.

4. In particular, the Centre contributed to expected accomplishment (b) (Strengthened regional cooperation mechanisms in trade, investment, enterprise development, innovation and technology transfer for inclusive and sustainable development) and expected accomplishment (c) (Increased capacity of ESCAP member States to formulate and implement policies on trade, investment, innovation, enterprise development and technology transfer for inclusive and sustainable development, including those that are gender-responsive) of subprogramme 2 of the strategic framework for the period 2016–2017.

5. The Centre also contributed to expected accomplishment (b) (Broadened and deepened capacity of member States to advance trade, investment, enterprise development, science, technology and innovation that support sustainable development and include gender perspectives) and expected accomplishment (c) (Strengthened regional engagement to advance trade, investment, enterprise development, science, technology and innovation for sustainable development) of subprogramme 2 of the strategic framework for the period 2018–2019.

6. The Governing Council of the Centre is composed of representatives of 12 ESCAP member States and one representative nominated by the host country, India. At its seventy-third session, in 2017, the Commission elected Bangladesh, China, Fiji, Indonesia, the Islamic Republic of Iran, Kazakhstan, Malaysia, Pakistan, the Philippines, the Republic of Korea, Sri Lanka and Thailand as members of the Council for the period 2017–2020. The Council meets once a year, advises on the formulation and implementation of the programme of work and reviews the administrative and financial status of the Centre. All activities of the Centre are implemented in partnership with the national focal points designated by the respective elected member States with the active involvement of other partner institutions. The national focal points and partner institutions assist the Centre in hosting the training programmes,

mobilizing local networks and targeting participants for dissemination and outreach of its capacity-building programmes.

B. Alignment of the Centre's programme of work with regional needs for capacity-building on innovation and technology transfer for sustainable development

7. Technologies and innovation are central to long-term economic growth. The capacity of countries to compete in the global market depends more and more on their ability to innovate and apply the relevant technology to industries and productive sectors. Achieving the Sustainable Development Goals will require action in a number of areas, including harnessing and maximizing the potential of technological innovation in many areas of economic activity.

8. Although technology is supposed to be a key driver of economic growth, in practice its contribution to economic growth varies greatly across countries. Accelerating economic growth in countries with special needs is key to reducing income inequalities in the region, but most of these nations are hampered by low technological capabilities. The theme study for the seventy-fourth session of the Commission was entitled *Inequality in Asia and the Pacific in the era of the* 2030 *Agenda for Sustainable Development*. In the study, the following key reasons for innovation weakness in countries with special needs were highlighted: low absorptive capacity of firms, weaknesses in knowledge generation and diffusion, weak linkages between academia and industry, and weak framework conditions, together with poor infrastructure. Innovation activities, including the commercialization and transfer of technologies, and policies promoting the adoption and diffusion of technologies are important for ensuring that the poor benefit from technologies.

9. The Centre is actively engaged with countries in the Asia-Pacific region to help them to align national science, technology and innovation strategies with sustainable development; it is also engaged in helping developing and least developed countries in leapfrogging to bridge the technological divide with developed countries. The Centre helps member States to strengthen national innovation systems by enhancing innovation capacity, promoting technology transfer and deployment, and promoting technology entrepreneurship through multi-stakeholder partnerships and capacity-building events. Through targeted capacity-building events, knowledge products and regional cooperation platforms, the Centre facilitates knowledge-sharing among countries with regard to new and emerging technological sectors, such as renewable energy, nanotechnology and climate-resilient agriculture. While implementing its programme of work, the Centre leverages South-South, North-South and triangular cooperation modalities, in accordance with the needs of the member States.

II. Results and outcomes achieved since the first session of the Committee on Information and Communications Technology, Science, Technology and Innovation

10. Since the first session of the Committee on Information and Communications Technology, Science, Technology and Innovation, held from 5 to 7 October 2016, the Centre has continued to deliver demand-driven programmes on innovation and technology transfer through capacity-building activities, regional technology cooperation, and technology information sharing and networking. These activities support member States in advancing the 2030 Agenda for Sustainable Development. The focus areas are science,

technology and innovation policy; technology transfer and commercialization; enhancing the competitiveness of technology-based enterprises; and promoting new and emerging technologies such as biotechnology, nanotechnology and renewable energy.

11. Annex I contains a table with a list of the Centre's activities and a table with a list of the special issues of the *Asia-Pacific Tech Monitor* published during the reporting period.

A. Capacity-building

12. The Centre assisted member States with capacity-building to strengthen their national innovation systems by enhancing policymaking capacity, promoting technology transfer and deployment, enhancing the competitiveness of enterprises, and promoting new technologies and entrepreneurship. During this reporting period, the Centre focused on (a) training activities on innovation, technology transfer and commercialization skills and (b) regional technology cooperation.

1. Training activities on innovation, technology transfer and commercialization skills

13. The Centre contributed to strengthening the technology transfer capacity of science, technology and innovation stakeholders in the member countries. The training modules focused on developing skills for planning and managing technology transfer projects; technology transfer support services for small and medium-sized enterprises and entrepreneurs; and capacity-building for technology transfer and commercialization.

14. The Centre enhanced the technology transfer capacities of stakeholders through 15 demand-driven training programmes in eight member countries, namely China, India, Kazakhstan, Malaysia, Myanmar, the Philippines, Singapore and Thailand, reaching more than 500 participants.

15. Workshop evaluations indicated that more than 90 per cent of participants increased their understanding of key policy issues, strategies and good practices for promoting technology transfer and commercialization.

Key outputs

16. The capacity-building events and training activities enhanced understanding of the participating policymakers, representatives from technology promotion and transfer institutions, and science, technology and innovation stakeholders on policy interventions to achieve the Sustainable Development Goals, technology transfer mechanisms, technology development and commercialization platforms, and also concrete suggestions for follow-up actions were provided. The key outputs for this area include:

(a) In a workshop delivered in Manila, the Centre influenced the Government of the Philippines to consider expanding the mandate of the Department of Science and Technology to include agro-based enterprises in their portfolio;

(b) Through a project delivered in Myanmar, the Centre facilitated the transfer of 59 lines of elite mung beans for the benefit of smallholder farmers in Myanmar;

(c) The Centre influenced the government of the State of Andhra Pradesh, India, to promote innovation through fairs and annual events to support innovative small and medium-sized enterprises and technology entrepreneurship;

(d) The Centre initiated efforts for the signing of a memorandum of understanding between ESCAP and the Council of Scientific and Industrial Research of the Government of India to provide broad-based support to the Council laboratories in the areas of technology transfer and commercialization, capacity-building, and technology cooperation and networking in the Asia-Pacific region.

2. Strengthening national innovation systems

17. The Centre assisted member countries in strengthening their national innovation systems by enhancing innovation capacity, promoting technology transfer and deployment, enhancing the competitiveness of enterprises, and promoting new technologies and entrepreneurship. The activities were conducted in partnership with key national institutions in thematic areas such as the role of government in promoting innovation; science and technology parks; intellectual property handling; water sustainability; nanotechnology; biotechnology; the water-energy-food nexus; trade promotion and environmental policy development; and innovation management of small and medium-sized enterprises.

18. The Centre strengthened the capacities of stakeholders through 14 demand-driven activities in eight member countries, namely China, India, Indonesia, the Islamic Republic of Iran, Malaysia, the Philippines, Sri Lanka and Thailand, reaching more than 1,500 participants.

19. The evaluation of activities indicated that more than 80 per cent of participants increased their understanding of policy issues, strategies and good practices for facilitating nanotechnology, innovation and governance of national innovation systems.

Key outputs

20. The activities resulted in sharing best practices and strategies on technology transfer, commercialization and regulatory and institutional frameworks for enabling the innovation ecosystems of member countries. Key policy recommendations were also provided. The key outputs for this area include:

(a) Policy advice provided to the Government of India on adopting eco-innovation practices, at a national consultation on the Sustainable Development Goals held in India in August 2016;

(b) Policy advice provided to the Government of Indonesia on setting up science and technology parks at the International Conference on Science Technology Park in October 2016;

(c) Recommendations provided on establishing a collaborative regional cooperation framework in the water sector and creating an online compendium of water technologies at an international workshop on water sustainability held in India in April 2017;

(d) An international conference on nanotechnology was held in Malaysia in May 2017. One of the key recommendations from the conference was to establish a regional nano-safety platform for stakeholders in countries belonging to the Association of Southeast Asian Nations (ASEAN). The Government of Malaysia said it would take the lead role in establishing this

platform which would facilitate sharing of laboratories and facilities for testing of nano-materials and nano-products across the ASEAN region.

3. Regional technology cooperation

21. The Centre facilitated increased engagement and regional cooperation between member States to effectively harness science, technology and innovation for sustainable development. Some of the focus areas included science, technology and innovation policy and strategy, technology transfer and commercialization, innovation strategies for sustainable development, green technologies and the water-food-energy nexus.

22. The Centre, through regional technology cooperation activities, encourages member States to enhance South-South, North-South and triangular regional and international cooperation on science, technology and innovation.

23. The Centre promoted regional cooperation by facilitating the organization of the Governing Council sessions, international conferences and regional consultations. These programmes were aimed at government policymakers and designated officials from institutions in ESCAP member countries relating to science, technology and innovation, public research, technology and technology transfer.

Key outputs

24. The Centre organized activities to foster regional technical cooperation for achieving the Sustainable Development Goals through science, technology and innovation and for inclusive sustainable development. These activities facilitated the exchange of perspectives and experiences among science, technology and innovation stakeholders and provided a platform for member countries to share specific priorities and needs on innovation, technology transfer and commercialization. The key outputs for this area include:

(a) The twelfth and thirteenth sessions of the Governing Council of the Asian and Pacific Centre for Transfer of Technology were held in 2016 and 2017, respectively, in conjunction with two international conferences that provided the Council with substantive inputs for discussion and suggestions on future capacity-building activities;

(b) The two Council sessions and two international conferences successfully increased regional and South-South cooperation among the Council member countries to promote technology transfer; the Council adopted the Centre's programme of work for 2017 and 2018, which aims to strengthen member countries' South-South collaboration and technology transfer;

(c) The two international conferences provided a platform for policymakers and sector experts from the Council member countries to share experiences and best practices on key areas of science, technology and innovation;

(d) As a result of one of the regional consultations, the Government of Thailand proposed that it would design and host the regional knowledge platform on the water-energy-food nexus for sharing experiences, best practices and country-specific updates among the participating member countries.

B. Technology intelligence

25. One of the key mandates of the Centre is to provide a platform for the provision of technology information services to policymakers, technology transfer intermediaries and small and medium-sized enterprises in the Asia-Pacific region to enable them to build up a technology knowledge base to foster balanced growth in an environmentally sustainable manner. The Centre therefore facilitates transmission of information to strengthen the technology intelligence of member States to keep abreast of global technological developments and to use them strategically.

26. The Centre, through its knowledge products, research and technology information platforms and databases, complemented the substantive capacity-building programmes on various themes and topics related to science, technology and innovation.

1. Periodicals and knowledge products

27. The Centre publishes the online periodical *Asia-Pacific Tech Monitor* (www.techmonitor.net), which features articles on technology trends and developments, technology policies, the technology market, innovation management, technology transfer, and new products and processes. The online periodical was disseminated free of cost and shared with approximately 2,200 subscribers from member countries by email. The periodical was also regularly disseminated through the Centre's and the Commission's social media platforms. The nine special issues of *Tech Monitor* featured 39 articles by 69 authors and experts from 16 countries, including Australia, Austria, Bangladesh, China, India, Indonesia, Japan, Malaysia, Nepal, Pakistan, the Philippines, the Republic of Korea, Sri Lanka, Thailand, the United Kingdom of Great Britain and Northern Ireland and Viet Nam. The issues also included information on more than 100 of the latest technological innovations from around the world in areas such as biotechnology, sustainable/renewable energy technology, water, nanotechnology and rural applications. Technology policy and market-related news items from Asia-Pacific countries were also compiled and disseminated through *Tech Monitor*.

28. Approximately 90 short articles providing useful how-to guides, best practices and tips for small and medium-sized enterprises were disseminated in the section of the periodical entitled "Business coach for innovation firms". Additionally, the periodical included more than 100 selected technology offers and technology requests from 14 countries, including Bangladesh, China, Czechia, France, Hungary, India, the Islamic Republic of Iran, Malaysia, Pakistan, Poland, Sri Lanka, Thailand, the United Kingdom and Viet Nam. This information helped technology seekers to identify technology sources through the Centre. For instance, the Centre received a technology request from the National Agency for Technological Development of Kazakhstan for help in identifying potential providers of technologies noted in *Tech Monitor*.

29. The Centre also developed, published and disseminated 30 online issues of *Value Added Technology Information Service (VATIS) Update* on biotechnology (eight), food processing (four), new and renewable energy (eight), ozone layer protection (six) and waste management (four), which disseminated information on the latest technological innovations, technology policies and market-related developments, recent publications and events.

30. The Centre partnered with prominent institutions to jointly publish two issues of *VATIS Update. Ozone Layer Protection* was published with support from the Ozone Cell of the Ministry of Environment, Forest and Climate

Change of the Government of India. *Biotechnology* was co-published with the Biotech Consortium India Limited, an undertaking of the Government of India.

31. As recommended by the Governing Council at its twelfth session, held in December 2016, *VATIS Update* issues on food processing, ozone layer protection and waste management were discontinued, effective January 2017. Similarly, *VATIS Update* issues on biotechnology and new and renewable energy were discontinued, effective January 2018 as decided by the Council at its thirteenth session, held in November 2017. These issues were discontinued as a cost-saving and streamlining measure as *Tech Monitor* also covers the technology sectors that were the focus of *VATIS Update*.

32. More than 30,700 page views were recorded for the online periodicals, which were largely accessed by science, technology and innovation stakeholders in Australia, Brazil, China, Germany, India, Indonesia, the Islamic Republic of Iran, Italy, Japan, Malaysia, the Philippines, the Republic of Korea, Singapore, Sri Lanka, Thailand, the United Kingdom and the United States of America.

2. Research, analysis and reference materials

33. The Centre carried out normative and analytical studies of regional relevance to identify trends, highlight good policies and practices, and foster regional cooperation. In addition, the Centre produced reference materials. Those materials are detailed in the following paragraphs.

34. ***NIS Diagnosis and STI Strategy Development to Achieve National Sustainable Development Goals***. This training manual on national innovation systems describes the process of adopting a national innovation system framework and strategies to strengthen the process of creating and diffusing new technologies and innovation within a nation's economy. The manual is useful for policymakers working within government ministries and institutions that support technological change, as well as for researchers and students.

35. ***Policies, Institutions and Processes to Support Value Chains for Seed Development for Pulses, Legumes and Oil Crops in the Dry Zone of Myanmar***. This case study contains information on the critical issues and barriers for seed industry development in Myanmar to support policymakers in making informed decisions related to strengthening the value chain for the seed industry. The Centre highlighted that the current systems for seed production and distribution and the associated extension services are not able to meet the requirements of farmers in the dry zone of Myanmar. It also emphasized that a shift in the policy approach from the current top-down structure to a bottom-up approach with the active involvement of stakeholders from the grass-roots level is essential for strengthening the value chain for seed enterprise development in Myanmar.

36. ***Supporting Value Chains for Seed Development of Pulses, Legumes and Oil Crops in Myanmar's Dry Zone.*** This policy brief contains information on the barriers to and constraints on seed enterprise development in the dry zone of Myanmar. The formal seed distribution system is ineffective due to financial constraints as well as weaknesses in monitoring the process of seed distribution among contract farmers. This requires policymakers in Myanmar to consider developing a national seed policy to help to implement the Seed Law enacted in 2011. The Centre emphasized that the Government should increase funding to support research and development, testing and extension services and prioritize capacity-building of government officials, staff of seed-

related associations and farmers to accelerate the seed enterprise development in the country.

3. Online technology platforms and databases

37. The Centre integrated various stand-alone information technology databases and tools into one single website in order to facilitate usage by member countries. As part of this initiative, the technology databases from the Centre's key technology transfer portal, Technology4SME.net, was migrated to the Centre's website. The Renewable Energy Cooperation-Network for the Asia-Pacific website was migrated and integrated with the Centre's website to provide ease of access to users interested in renewable energy technologies and partnerships. The Centre designed a new section, Global Technology Databases, on its website to replace Asia-Pacific Technology Information Tracking and Unified Data Extraction (APTITUDE) and the search functions available through this search engine. The Global Technology Databases section currently provides direct access to various national and international technology databases to the users of the Centre's technology transfer services.

38. The Centre facilitated business-to-business meetings in specific sectors in partnership with key nodal agencies in member countries; provided technology information services through information portals and technology publications; and established specialized technology transfer networks in specific sectors to enhance cross-border technology-based business and research cooperation.

III. Future focus areas and programmes

39. The Centre assists members and associate members of ESCAP in strengthening innovation and technology transfer capacities that are critical to achieving the Sustainable Development Goals. In addition, the Centre's programme of work is aligned with the Technology Facilitation Mechanism launched by the United Nations, which aims to increase the creation and use of innovative technologies through multi-stakeholder partnerships to help to achieve the 2030 Agenda for Sustainable Development.

A. Ongoing projects

40. Sustainable Development Goal 17 of the 2030 Agenda identifies technology as one of the key means of implementation. In partnership with the Trade, Investment and Innovation Division of ESCAP, the Centre is implementing a project on evidence-based innovation policy for effective implementation of the 2030 Agenda in the Asia-Pacific region. The project was awarded funding from the eleventh tranche of the United Nations Development Account.

41. Through this project, the Centre will strengthen the capacity of least developed countries in South Asia, South-East Asia and small island developing States to formulate evidence-based innovation policy. Activities under this project will be implemented in partnership with key nodal agencies working on science, technology and innovation, technology development and promotion agencies, policymakers, industrial federations and non-governmental organizations through a variety of cooperation modalities, including South-South, North-South and triangular cooperation. Implementation started in 2018, and all activities are expected to be completed in 2021.

42. The Centre will continue to publish and upgrade the periodical *Asia-Pacific Tech Monitor*. The periodical will continue to be disseminated widely through the Centre's website and social media, such as Facebook and Twitter.

B. Forthcoming events in 2018

43. Annex II contains a table with a list of forthcoming activities to be organized by the Centre and held from June 2018 onwards.

IV. Matters calling for the attention of the Committee

44. The capacity-building activities of the Centre can play an important role in supporting member States in advancing the 2030 Agenda and the Addis Ababa Action Agenda of the Third International Conference on Financing for Development. The Centre seeks inputs and suggestions from the Committee on which frontier technology the Centre's programme of work should focus on as well as on the specific needs of the member countries with regard to capacity-building for innovation and technology transfer.

45. The Centre also requests the Committee to consider the following:

(a) The provision of support in identifying appropriate partner organizations, national channels of communication for strengthening outreach, and strategies to enhance collaboration with government agencies related to the thematic areas;

(b) The recommendation of the Governing Council at its thirteenth session to significantly increase the financial support to ensure that the Centre has the minimum level of human and financial resources required to effectively implement its mandate of assisting member States to achieve the Sustainable Development Goals. The Council also recommended that the host country, India, should substantially enhance its contribution to the Centre and that non-contributing Council members should consider providing voluntary contributions to the Centre to strengthen its financial basis;

(c) Financing for new technical cooperation projects or developing new joint projects, based on the requests for technical cooperation activities by member States;

(d) Contributing national experts to work at the Centre, which would enable the experts to benefit from work experience at the Centre and would ease the current human resource constraints faced by the Centre.

Annex I

Table 1
Asian and Pacific Centre for Transfer of Technology activities carried out during the reporting period of 1 January 2016 to 30 June 2018

No.	*Title, venue, date*	*Results*	*Partners*	*Sustainable Development Goal*
1	Workshop on Developing and Strengthening the Manufacturing Sector through Skill Development in Networking and Technology Transfer, New Delhi, 28 January 2016	Contributed to enhanced capacities of participants on technology transfer and business networking and its implementation	Federation of Indian Export Organizations, India	9
2	Workshop on Best Practices in Mung Bean (Green Gram) Seed Production, Quality Control and Maintenance, Magway, Myanmar, 29 February and 1 March 2016	Sharing of best practices in mung bean seed production; 28 participants attended from organizations and nodal agencies from Myanmar and experts from India	Department of Agricultural Research, Myanmar	8, 9
3	Training programme on New Models of Partnership and Technology Transfer, Ghaziabad, India, 9–11 March 2016	Enhanced capacities of participants on technology transfer and commercialization	Human Resource Development Centre of the Council of Scientific and Industrial Research, Ministry of Science and Technology, India	9
4	Food Security – Low Water Agriculture – The Next Solution?, Kuala Lumpur, 13 April 2016	Increased awareness of the contribution of agriculture to food security; representatives from Indonesia, Malaysia, and Singapore attended	Human Life Advancement Foundation, Malaysia	2, 6, 7
5	Regional Agricultural Innovation Summit, Bangkok, 25 and 26 May 2016	Increased awareness of contribution of agricultural technologies to addressing the Sustainable Development Goals; representatives from Bangladesh, Cambodia, Japan, Nepal, Thailand, the United States of America and Viet Nam attended	United States Agency for International Development, Winrock International	2, 6

No.	*Title, venue, date*	*Results*	*Partners*	*Sustainable Development Goal*
6	Fourth China-South Asia Expo and Second Forum on China-South Asia Technology Transfer and Collaborative Innovation, Kunming, China, 12–14 June 2016	Increased awareness of the activities of the Centre in technology innovation and transfer of technology; 1,000 participants from South Asian countries attended	Yunnan Academy of Scientific and Technical Information, China	9
7	Regional Workshop on Overcoming Critical Bottlenecks to Accelerate Renewable Energy Deployment in ASEAN+6 Countries, Bangkok, 14 and 15 June 2016	Enhanced knowledge of how regional and international platforms could be effectively used for promoting renewable power deployment in ASEAN+6 countries; 107 participants attended, including from Cambodia, France, Indonesia, Japan, the Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Thailand, the United Arab Emirates and Viet Nam	International Renewable Energy Agency, Thailand Institute for Scientific and Technological Research, Thailand	7, 9, 17
8	Second National Consultation on Sustainable Development Goals 8 and 9, New Delhi, 2 and 3 August 2016	Enhanced knowledge of government initiatives impacting eco-innovation; attended by 70 senior policymakers and representatives from think tanks and international agencies	Research and Information System for Developing Countries, India	8, 9
9	Regional Workshop on Enhancing Innovation and Competitiveness of Micro-, Small and Medium-sized Enterprises in Response to the Association of Southeast Asian Nations (ASEAN) Integration for Agro-Enterprise, Manila, 28 and 29 September 2016	Contributed to enhanced understanding of how agro-enterprises in the Philippines could leverage opportunities provided by the ASEAN framework; recommended that the Department of Science and Technology include agro-enterprises in its mandate; 59 participants attended, including from Indonesia, Japan and the Philippines	Technology Application Promotion Institute, Department of Science and Technology, Philippines	7, 9, 17
10	First Indonesia International Conference on Science Technology Park, Bogor, Indonesia, 12 and 13 October 2016	Policy recommendations for enabling the setting up of science technology parks for promoting innovation; attended by 100 senior policymakers, researchers and representatives from the private sector	Indonesian Institute of Sciences, Indonesia	9

No.	*Title, venue, date*	*Results*	*Partners*	*Sustainable Development Goal*
11	Accelerating Low-Carbon Technology Transfer: Helping Developing Countries Implement Nationally Determined Contributions, Asian Development Bank Roundtable and Singapore International Energy Week 2016, Singapore, 27 October 2016	Identification of the support needed by developing countries to allow and foster accelerated transfer and diffusion of low-carbon technologies and increased knowledge of key energy-sector insights on the challenges faced	Economic Research Institute for ASEAN and East Asia, Singapore	
12	Workshop on Practices in Farmer-led Seed Enterprise Development for Improving Seed Quality and Enhancing Revenue Generation, Mandalay, Myanmar, 8 and 9 November 2016	Identified solutions and best practices for establishing effective and efficient farmer-led seed enterprises in the dry zone of Myanmar; 20 participants attended mainly from India and Myanmar	Department of Rural Development of the Ministry of Agriculture, Livestock and Irrigation, Myanmar	2, 9
13	International Conference on Innovation Strategies for Sustainable Development, Islamabad, 19 December 2016	Increased awareness of best practices for public policies and strategies for facilitating innovation for sustainable development, supporting innovative entrepreneurs; attended by 80 participants	Ministry of Science and Technology, Pakistan	17
14	Twelfth session of the Governing Council of the Asian and Pacific Centre for Transfer of Technology, Islamabad, 19–21 December 2016	Enhanced capacities of policymakers for South-South cooperation; 10 Governing Council member countries participated: China, Fiji, Indonesia, Malaysia, Pakistan, the Philippines, the Republic of Korea, Sri Lanka, Thailand and Viet Nam	Ministry of Science and Technology, Pakistan	17
15	International Seminar on Technology Transfer as a Tool to Optimize IP and Innovation, New Delhi, 9 January 2017	Increased awareness of best practices for technology transfer and commercialization	National Research Development Corporation, India	9
16	Consultative meetings on Science, Technology and Innovation, Tehran, 9 and 10 April 2017	Enhanced awareness of policymakers of science, technology and innovation policies and strategies for innovation	Ministry of Science, Research and Technology, Iranian Research Organization for Science and Technology, Islamic Republic of Iran	9, 17

No.	*Title, venue, date*	*Results*	*Partners*	*Sustainable Development Goal*
17	International Workshop on Science, Technology, Innovation and Management for Water Sustainability, New Delhi, 19 and 20 April 2017	Increased knowledge and understanding of innovative water technologies and their commercialization and use for providing affordable and safe water; 40 participants attended, namely from Bangladesh, Bhutan, India, Nepal and Sri Lanka	National Institute of Science, Technology and Development Studies, India	6, 9
18	International Conference on Nanotechnology for Safe and Sustainable Development and consultative meeting on proposed ASEAN nano-safety networking platform, Putrajaya, Malaysia, 2–4 May 2017	Proposed establishing a nano-safety networking platform for stakeholders in ASEAN; 112 participants attended, namely from Indonesia, Malaysia, Pakistan, the Philippines, the Republic of Korea, Singapore, Thailand and Viet Nam	National Nanotechnology Centre, Ministry of Science, Technology and Innovation, Government of Malaysia	9
19	Regional Consultation on Innovation Strategies for Sustainable Development through the Water-Energy-Food Nexus, Bangkok, 28 and 29 June 2017	Enhanced capacities of policymakers for regional cooperation and strategies for sustainable management of water, energy and food resources; 111 participants attended, namely from China, India, Indonesia, Japan, Malaysia, the Philippines, Thailand and Viet Nam	Thailand Institute of Scientific and Technological Research, Thailand	2, 6 and 7
20	Symposium on Progress on Sustainable Development Goal 7 and its Interlinkages with other Sustainable Development Goals, Bangkok, 28–30 June 2017	Increased knowledge of policy recommendations for sustainable development through water-energy-food policies	Department of Economic and Social Affairs of the United Nations	7
21	Indo-Global Skills Summit and Expo 2017, New Delhi, 28 July 2017	Enhanced understanding of the role of government in promoting innovative entrepreneurship	Indus Foundation, India	9
22	International Innovation Fair and International Workshop on Supporting Innovative Entrepreneurs and the Role of Technology Transfer, Visakhapatnam, India, 9–11 September 2017	Contributed to enhanced capacities of participants on opportunities for technology transfer and innovation-led entrepreneurship; 104 participants attended, including from Bahrain, Bangladesh, China, India, Indonesia, the Islamic Republic of Iran, Kazakhstan, Lebanon, Morocco, Pakistan,	Government of Andhra Pradesh, India, Indian Innovators Association, India	17

No.	*Title, venue, date*	*Results*	*Partners*	*Sustainable Development Goal*
		the Philippines, the Republic of Korea, Singapore, Switzerland, the Syrian Arab Republic and Ukraine		
23	International Training Programme on Skill Development and Employment Generation, Noida, Uttar Pradesh, India, 15 September 2017	Enhanced knowledge and capacities of participants on technology transfer tools and its implementation; 30 countries were represented	Ministry of Labour and Employment, Ministry of External Affairs, India, International Labour Organization	8, 9, 17
24	Regional Workshop on Trade and Environment for Asia and Pacific Economies, Colombo, 18 and 19 September 2017	Contributed to the knowledge of policymakers and senior officials on trade promotion and environmental policy development; more than 30 senior officials involved in trade promotion and environmental policy development from 20 countries in the Asia-Pacific region actively participated	Trade, Investment and Innovation Division of the Economic and Social Commission for Asia and the Pacific (ESCAP), World Trade Organization, Ministry of Industry and Commerce, Sri Lanka	8, 9, 17
25	International Workshop on Promoting Biotechnology Education, Research and Knowledge Transfer in Asia and the Pacific, Faridabad, India, 15 and 16 October 2017	Enhanced opportunities for multilateral biotechnology mobility; 35 participants attended, from Cambodia, India, Indonesia, Japan, the Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Viet Nam	United Nations Educational, Scientific and Cultural Organization, Ministry of Science and Technology, India, Ministry of Education, Culture, Science and Technology, Japan	7, 9, 17
26	Workshop on Technology Commercialization and Transfer, Ghaziabad, India, 1–3 November 2017	Enhanced capacities of participants on technology transfer and commercialization; 35 participants attended from the Council of Scientific and Industrial Research institutes from India and representatives from the Embassy of the Russian Federation in India	Human Resource Development Centre, of the Council of Scientific and Industrial Research, Government of India	9, 17
27	ESCAP and World Intellectual Property Organization Regional Meeting on Building the Innovation and Technological Capacities of Least Developed Countries in Asia and the	Recognition of priority needs of least developed countries in the region to develop cooperation programmes in innovation and technology capacity-building; 27 participants attended, from Bhutan, Cambodia, the Lao	Division of Trade, Investment and Innovation of ESCAP, World Trade Organization	9, 17

No.	*Title, venue, date*	*Results*	*Partners*	*Sustainable Development Goal*
	Pacific, Bangkok, 6 and 7 November 2017	People's Democratic Republic, Malaysia, Myanmar and Nepal		
28	Thirteenth session of the Governing Council of the Asian and Pacific Centre for Transfer of Technology, Manila, 28–30 November 2017	Enhanced capacities of policymakers for South-South cooperation; 13 Governing Council member countries participated: Bangladesh, China, Fiji, India, Indonesia, the Islamic Republic of Iran, Kazakhstan, Malaysia, Pakistan, the Philippines, the Republic of Korea, Sri Lanka, and Thailand	Technology Application and Promotion Institute, Department of Science and Technology, Philippines	17
29	Regional Consultation on Achieving Sustainable Development Goals through Science, Technology and Innovation, Bangkok, 20 March 2018	Enhanced capacities of policymakers for South-South cooperation for achieving the Sustainable Development Goals through science, technology and innovation; 80 participants attended from several countries, including from Japan, the Republic of Korea and Singapore	Ministry of Science and Technology, Thailand	9, 17
30	Workshop on Strengthening Technology Transfer and Technology Commercialization Capacities of Countries in Central Asia, Astana, 30 and 31 May 2018	Increased capacities with regard to technology transfer and technology commercialization in Central Asia; 200 participants attended	Economic Commission for Europe, National Agency for Technological Development, Kazakhstan	9, 17
31	Third Forum on China-South Asia Technology Transfer and Collaborative Innovation, Kunming, China, 14–16 June 2018	Increased capacities of participants on technology transfer and innovation; 800 participants attended	Ministry of Science and Technology, China, government of Yunnan Province, China	9, 17

Table 2
Special issues of *Asia-Pacific Tech Monitor* (2016–2018)

No.	*Issue*	*Special themes*
1	January–March 2018	Enhancing technology access to reduce inequality
2	October–December 2017	Big data innovation for sustainable development and humanitarian action
3	July–September 2017	Innovation, technology transfer and management for safe and sustainable water
4	April–June 2017	Science technology and innovation for achieving the Sustainable Development Goals in the Asia-Pacific region
5	January–March 2017	Sustainable energy technologies: challenges and opportunities for Asia and the Pacific (in support of the theme of the seventy-third session of the Economic and Social Commission for Asia and the Pacific (ESCAP)
6	October–December 2016	Digital technology and economy fostering inclusive development
7	July–September 2016	Social innovation for inclusive and sustainable development: current practices and challenges
8	April–June 2016	Technology transfer through foreign direct investment: policy approaches in the Asia-Pacific region
9	January–March 2016	Science, technology and innovation to achieve the 2030 Agenda for Sustainable Development (in support of the theme of the seventy-second session of the Commission)

Annex II

Forthcoming activities of the Asian and Pacific Centre for Transfer of Technology, from June 2018

No.	*Date*	*Title*	*Venue*	*Partners*
1	27–29 June	Workshop on Rural Industries: Establishment, Sustainability and Challenges	Sonipat, India	Indian Institute of Technology Delhi, India
2	18 and 19 July	Regional Forum on Strategies to Enhance Innovation and Management Capacities of Start-ups and Small and Medium-sized Enterprises	Manila	Technology Application and Promotion Institute, Department of Science and Technology, Philippines
3	27 and 28 August	Regional Workshop on Achieving the Sustainable Development Goals through Science, Technology and Innovation Sectoral Interventions	Bangkok	Thailand Institute of Scientific and Technological Research, Thailand
4	29–31 August	Second session of the Committee on Information and Communications Technology, Science, Technology and Innovation	Bangkok	
5	September/October	Workshop on Technology Transfer and Technology Commercialization	Ghaziabad, India	Human Resource Development Centre of the Council of Scientific and Industrial Research, Ministry of Science and Technology, India
6	23 and 24 October	2018 fourth industrial revolution conference on new and emerging technologies in achieving the Sustainable Development Goals	Kuala Lumpur	Ministry of Science, Technology and Innovation, Malaysia
7	1 and 2 November	International Conference on Technology Transfer and Internationalization of Technology-based Small and Medium-sized Enterprises and Start-ups	Jakarta	Indonesian Institute of Sciences, Indian Ocean Rim Association
8	27–30 November	Fourteenth session of the Governing Council of the Asian and Pacific Centre for Transfer of Technology and international conference on a theme related to new and emerging technologies	Bangkok	Ministry of Science and Technology, Thailand Institute of Scientific and Technological Research, Thailand

B18-00808